

INTRODUCTION

Forecasts of aviation demand establish the nature and extent of future aviation activity. These forecasts are used to determine the ability of existing facilities to meet future demands in the form of the facility requirements review in Chapter Three.

This forecast of aviation demand for the Eastern West Virginia Regional Airport (MRB) Master Plan is for a 20-year planning period, from 2016 through 2036, with 2016 as the base year. This Master Plan will recommend forecasts based on the review of the current Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) and the FAA's national forecast trends of aircraft operations and fleet mix. These forecasts will be considered for applicability within the shifting operational climate for MRB and adopted for the purposes of MRB's airport planning.

While there are military operations at MRB by the West Virginia Air National Guard (ANG), the focus of this Master Plan is general aviation activity. A recommended design aircraft for purposes of airport planning will also be determined. Forecasts are to be prepared for the following phases:

PHASE I	PHASE II	PHASE III
Short Term	Intermediate Term	Long Term
0-5 Years	6-10 Years	11-20 Years





Part 02 | Historic Operations

Part 03 | Historic Based Aircraft

2.1 | Part 01 - Types of General Aviation Operations

Historical levels of aviation activity at MRB indicate trends in aviation demand that provide a basis for the forecast analysis in this chapter. With the base year defined as 2016, trends were reviewed for 15 years of historic data from 2002-2016 using the FAA TAF issued January 2017 as well as trends from 10 years (2007-2016) of Air Traffic Control Tower (ATCT) records.

Metrics of aviation activity and their definitions include the following:

- Commuter Operation an aircraft operation conducted by a scheduled Part 135 certificated aircraft. Part 135 refers to 14 CFR Part 135, Air Carrier and Operator Certification (Part 135), the federal regulatory requirements for operators that provide air transportation of persons or property for compensation or hire.
- Air Taxi Operation an aircraft operation conducted by an unscheduled Part 135 certificated aircraft.
- Local Operation a takeoff or landing by an aircraft that is operating entirely within the local traffic pattern and within sight of the airport; or departing or arriving from a practice area within 20 miles of the airport.
- **Itinerant Operation** an aircraft takeoff or landing other than local.



2.1|Part 02 - Historic Operations

MRB serves a diverse group of users. These users, observations of trends, and special airport uses include the following and are reflected in the TAF activity (see **Table 2.1**) and ATCT activity (see **Table 2.2**) levels shown, while **Figure 2.1** shows the comparison of both the TAF and ATCT annual activity:

- Air taxi and commuter operations are flat at MRB and estimated at 250 annually in the TAF.
- Itinerant military operations have been consistent; however, local military operations have declined from 2002 to 2016 by 37.5 percent.
- ATCT data does not distinguish between local and itinerant operations; nor does the data that is reported distinguish between civil and military operations.
- ATCT and TAF report significant differences in historical operations. For base year 2016, the ATCT reports total operations of 26,135, which is significantly lower than the 2017 TAF number of 65,763 operations.
- ATCT historical data shows an average annual *growth* of 4.5 percent in operations from 2007-2016.
- TAF historical data reflects a *decline* in total operations of -1.3 percent from 2002-2016.



Table 2.1- Historic FAA TAF Operations

FISCAL YEAR	II	INERANT C	PERATION	S	LOC	AL OPERAT	IONS	TOTAL ANNUAL OPERATIONS
	Air Taxi & Commuter	General Aviation	Military	Total	Civil	Military	Total	
2002	250	20,000	20,000	40,250	20,000	20,000	40,000	80,250
2003	250	20,500	20,000	40,750	20,500	20,000	40,500	81,250
2004	250	20,982	20,000	41,232	20,941	20,000	40,941	82,173
2005	250	21,603	20,000	41,853	21,317	20,000	41,317	83,170
2006	250	22,007	20,000	42,257	21,714	20,000	41,714	83,971
2007	250	22,418	20,000	42,668	22,118	20,000	42,118	84,786
2008	250	15,000	25,000	40,250	12,500	20,000	32,500	72,750
2009	250	15,000	25,000	40,250	12,500	20,000	32,500	72,750
2010	250	15,000	25,000	40,250	12,500	20,000	32,500	72,750
2011	250	15,000	25,000	40,250	12,500	20,000	32,500	72,750
2012	250	15,000	25,000	40,250	12,500	20,000	32,500	72,750
2013	250	15,000	12,500	27,750	12,500	12,500	25,000	52,750
2014	250	15,000	25,000	40,250	12,500	12,500	25,000	65,250
2015	250	15,000	25,000	40,250	12,500	12,500	25,000	65,250
2016	250	15,280	25,000	40,530	12,733	12,500	25,233	65,763

Source: FAA TAF Published Jan. 2017

Table 2.2- Historic ATCT Operations

FISCAL YEAR	TOTAL ANNUAL OPERATIONS
2007	18,588
2008	24,760
2009	23,347
2010	26,691
2011	29,671
2012	28,589
2013	24,456
2014	24,694
2015	26,385
2016	26,135





Figure 2.1 shows a comparison of the historical TAF to the actual total annual operations recorded by the MRB ATCT.

Commercially available data for flights operating on instrument flight plans over the past three years indicate the highest number of operations are from B-II, C-II, and D-II aircraft. For example, the Beechcraft Super King Air 200 (B-II) has the highest number of instrument operations of all aircraft based at the airport (see Appendix E).

COMPARISON OF ANNUAL TAF OPERATIONS AND ATCT OPERATIONS

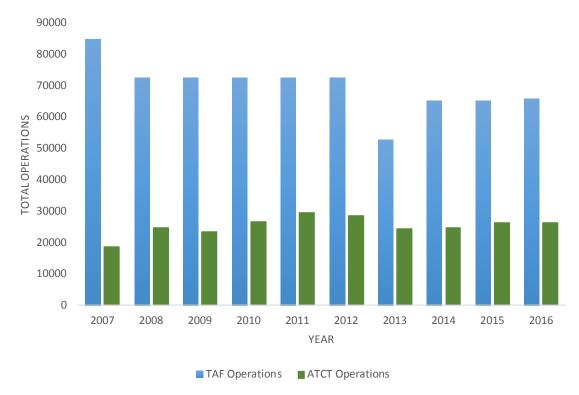


Figure 2.1- Comparison of Annual TAF Operations and ATCT Operations Source: FAA TAF Published Jan. 2017; Airport Records, MRB ATCT



2.1|Part 03 - Historic Based Aircraft

The 2017 TAF reports that from 2002 to 2016 MRB experienced an overall decrease in based aircraft (see **Table 2.3**). From 2002 to 2007, based aircraft increased from 76 to 87; but from 2008 to 2016, the number of based aircraft declined from 81 to 59 (see **Table 2.3** and **Figure 2.2**). According to airport records, trends in the decline in the number of based aircraft may be attributed to a major runway reconstruction project that took place from 2006 to 2012. Due to the multi-phased project, the primary runway was shortened significantly which impacted the types of aircraft that could utilize the runway. The operational impact of this project may have caused based aircraft at MRB to relocate to nearby facilities.¹

In reviewing airport records, the number of based aircraft between 2000 to 2016 fluctuated. **Figure 2.3** illustrates from 2000 to 2009, the based aircraft decreased from 104 to 59; however, from 2010 to 2016, the based aircraft increased from 74 to 90. The FAA's online *National Based Aircraft Inventory Program*, indicates the airport validated 91 based aircraft as of April 2017.

Table 2.3- FAA TAF Based Aircraft

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FISCAL YEAR	NUMBER OF BASED AIRCRAFT
2002	76
2003	78
2004	76
2005	87
2006	87
2007	87
2008	81
2009	81
2010	69
2011	69
2012	79
2013	72
2014	72
2015	58
2016	59

Source: FAA TAF published Jan. 2017



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 $^{1 \\ \}qquad \text{http://www.airportimprovement.com/article/eastern-west-virginia-regional reconstructs-runway-handle-c-5-traffic}$

HISTORIC FAA TAF BASED AIRCRAFT (2002-2016)

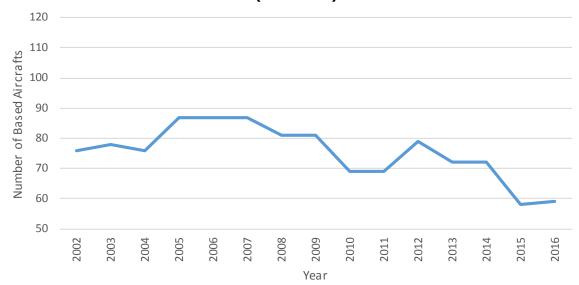


Figure 2.2- Historic FAA TAF Based Aircraft (2002-2016) Source: FAA TAF published Jan. 2017

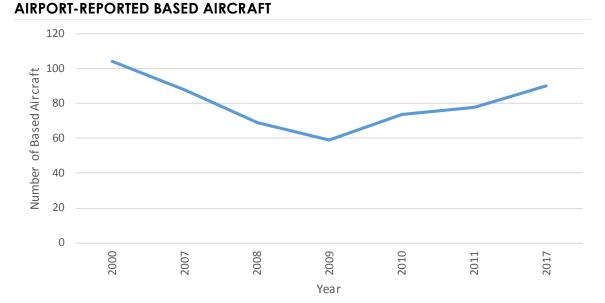


Figure 2.3- Airport-Reported Based Aircraft Source: Airport Records





In addition to the 2017 TAF, FAA Form 5010-1, and records provided by the airport, the FAA Aerospace Forecast for Fiscal Years 2016-2036 (FAA Long Range Forecast) was reviewed in preparing the forecast of aviation demands. The general aviation forecasts in this Master Plan rely upon the growth factors developed by the FAA in its publication of FAA Long Range Forecast as well as those factors derived from the 2017 TAF for Eastern West Virginia Regional Airport.

The FAA Long Range Forecast indicates that the long-term outlook for general aviation aircraft growth is favorable. The total number of general aviation aircraft in the national fleet is forecast to increase at a rate of 0.2 percent a year through 2036. This will be led by light sport, which will grow at a rate of 4.5 percent per year, followed by jet and turbo-prop aircraft at a rate of 2.6 percent per year and rotorcraft at a rate of 2.5 percent per year. Single-engine and multi-engine (fixed-wing) piston aircraft numbers are projected to decrease at 0.6 percent per year.

Similarly, the FAA study predicts that general aviation operations will also increase through 2036, gaining a moderate 1.2 percent per year. Fixed-wing piston aircraft operations will decline at the rate of 0.6 percent per year. Light sport aircraft operations will increase at the rate of 5 percent per year. Jet operations will increase by 3.1 percent per year, and rotorcraft will experience a 2.5 percent increase annually.

The FAA Long Range Forecast's growth projections for based aircraft and operations are tabulated in **Table 2.4**.



In view of the ongoing efforts of both the EWVRAA and Berkeley County to develop the adjacent industrial park, it is reasonable that MRB will experience growth in based aircraft, particularly with turbo-prop, jet, rotorcraft, and light sport, consistent with the general aviation fleet mix growth rate as annotated in the FAA's Long Range Forecast as defined in **Table 2.4**. Presently, MRB has no based, light sport aircraft. The jet based aircraft are for military; there are no jet based aircraft for civilian use. Historical trends of itinerant operations at MRB suggests that aircraft such as jet (civilian) and light sport are most likely to base at MRB in the future. The forecast projections do not anticipate that the number of military jet based aircraft will increase over the planning period. Trends of MRB 2017 TAF data also indicate that the based aircraft may increase at a rate higher than the national trend, which is 1.7 percent compared to the national forecast of 0.2 percent.

Table 2.4- FAA Aerospace Forecasts for Fiscal Years 2016-2036

ANNUAL GROWTH R	ATES PER YEAR
Fleet (Based Aircraft)	0.2%
Operations	1.2%

GENERAL AVIATION FLEET MIX

	Single- Engine Piston	Multi- Engine Piston	Turbo- Prop	Jet	Rotorcraft	Light Sport
Fleet	-0.6%	-0.6%	2.6%	2.6%	2.5%	4.5%
Operations	-0.6%	-0.6%	2.6%	3.1%	2.5%	5.0%

Source: FAA Aerospace Forecasts for Fiscal Years 2016-2036



For planning purposes, the TAF growth rate (1.7 percent) and the FAA Long Range Forecast growth rate (0.2 percent) were averaged to attain a new average annual growth rate of 0.95 percent for based aircraft at MRB. It is also assumed that the single-engine piston and multi-engine piston number of based aircraft will experience no growth, and MRB's fleet operations for these types of aircraft will experience growth at an annual rate of 0.5 percent. As, historical data at MRB shows growth of based aircraft, it is assumed that single-engine piston and multi-engine piston aircraft will increase slightly and not decrease as national trends suggest; and turbo-prop, jet, and rotorcraft will increase at rates similar to national trends (see **Table 2.5**).

Operations at MRB are also anticipated to increase. The 2017 TAF anticipates an annual increase of one percent from 2016 to 2036. Historical data from the ATCT confirms that operations have increased annually by 4.5 percent. Despite the difference in the volume of operations reported between the ATCT data and the 2017 TAF data, trends in positive growth are present. For planning purposes, the forecasted general aviation annual growth rate for operations as defined by the FAA Long Range Forecast of 1.2 percent was applied to MRB to attain the projected number of operations at MRB (see **Table 2.5**).

A comparison of MRB's projected forecast to the 2017 TAF is included (see **Tables 2.6** and **2.7**). Due to differences between the airport records and the 2017 TAF, the forecast numbers are not within plus or minus 10 percent of the TAF forecasts. However, the growth rates between the forecasts and the 2017 TAF are comparable (see **Figures 2.4** and **2.5**).

Table 2.5- MRB Forecasts FY 2016-2036

ANNUAL GROWTH	RATES PER YEAR
Fleet (Based Aircraft)	0.95%
Operations	1.2%

GENERAL AVIATION FLEET MIX

	Single- Engine Piston	Multi- Engine Piston	Turbo- Prop	Jet	Rotorcraft	Light Sport
Fleet	0.0%	0.0%	2.6%	2.5%	2.5%	4.5%
Operations	0.5%	0.5%	2.6%	3.10%	2.5%	5.0%

Source: Delta Airport Consultants, Inc.

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Table 2.6- Comparison of Based Aircraft Forecast to FAA Terminal Area Forecasts

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	YEAR	TOTAL BASED AIRCRAFT (THIS MASTER PLAN)	PERCENT DIFFERENCE	TOTAL BASED AIRCRAFT (FAA TAF)
	2016	91	54.24%	59
	2017	92	53.33%	60
	2018	93	52.46%	61
	2019	93	50.00%	62
	2020	94	49.21%	63
	2021	95	48.44%	64
	2022	96	47.69%	65
	2023	97	46.97%	66
	2024	98	46.27%	67
	2025	98	44.12%	68
	2026	99	43.48%	69
	2027	100	42.86%	70
	2028	101	42.25%	71
	2029	102	41.67%	72
	2030	103	41.10%	73
	2031	104	40.54%	74
	2032	105	40.00%	75
	2033	105	38.16%	76
	2034	106	37.66%	77
	2035	107	37.18%	78
	2036	108	36.71%	79

Source: FAA TAF published Jan. 2017, Delta Airport Consultants, Inc. Analysis

COMPARISON OF BASED AIRCRAFT FORECAST TO FAA TERMINAL AREA FORECASTS

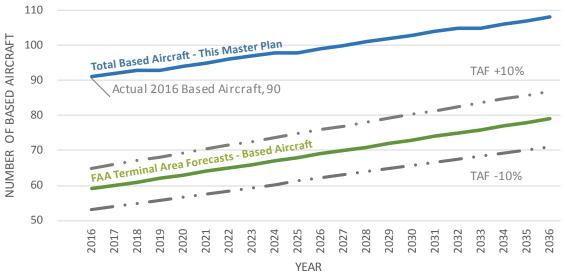


Figure 2.4- Comparison of Based Aircraft Forecast to FAA Terminal Area Forecasts Source: FAA TAF published Jan. 2017; Delta Airport Consultants, Inc. Analysis

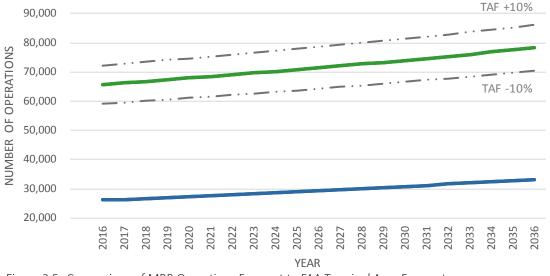
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Table 2.7- Comparison of MRB Operations Forecast to FAA Terminal Area Forecasts

YEAR	TOTAL ANNUAL OPERATIONS (THIS MASTER PLAN)	PERCENT DIFFERENCE	TOTAL OPERATIONS (FAA TAF)		
2016	26,135	-60.26%	65,763		
2017	26,449	-60.10%	66,284		
2018	26,766	-59.94%	66,815		
2019	27,087	-59.79%	67,356		
2020	27,412	-59.63%	67,908		
2021	27,741	-59.49%	68,472		
2022	28,074	-59.34%	69,047		
2023	28,411	-59.20%	69,632		
2024	28,752	-59.06%	70,228		
2025	29,097	-58.92%	70,835		
2026	29,446	-58.79%	71,452		
2027	29,799	-58.66%	72,080		
2028	30,157	-58.53%	72,721		
2029	30,519	-58.41%	73,374		
2030	30,885	-58.29%	74,039		
2031	31,256	-58.17%	74,717		
2032	31,631	-58.05%	75,408		
2033	32,010	-57.94%	76,113		
2034	32,395	-57.84%	76,831		
2035	32,783	-57.73%	77,561		
2036	33,177	-57.63%	78,304		

Source: FAA TAF published Jan. 2017, Delta Airport Consultants, Inc. Analysis

COMPARISON OF MRB OPERATIONS TO FAA TERMINAL AREA FORECASTS







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Based aircraft at MRB was obtained from a count of actual aircraft by airport staff completed in January 2017. Applying the anticipated growth factors for MRB from **Table 2.5** and **Table 2.8** produces the forecasted based aircraft by type for the planning period.

Table 2.8- Forecast of Based Aircraft by Type

YEAR	SINGLE- ENGINE PISTON	MULTI- ENGINE PISTON	TURBO- PROP	JET	ROTORCRAFT	LIGHT SPORT	TOTAL
Base							
2016	67	13	2	8	1	0	91
Forecast							
2021	67	13	3	9	2	1	95
2026	67	13	4	10	3	2	99
2036	67	13	6	12	6	4	108

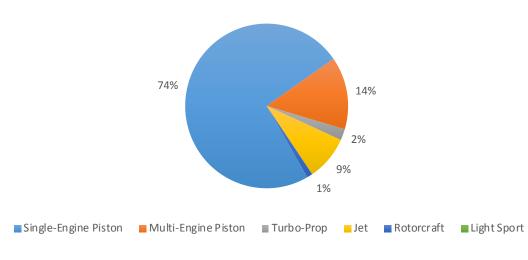
Sources: Delta Airport Consultants, Inc. Analysis, Airport Records



As depicted in **Figure 2.6**, the number of based light spot, rotorcraft, jet, and turboprop aircraft at MRB are anticipated to grow during the planning period, while the numbers of based piston aircraft are expected to decline.

2016 AND 2036 AIRCRAFT FLEET MIX FORECAST COMPARISON





2036

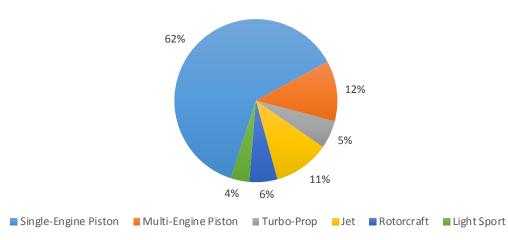


Figure 2.6- 2016 and 2036 Aircraft Fleet Mix Forecast Comparison Source: Delta Airport Consultants, Inc. Analysis





As described in the FAA Long Range Forecast, annual growth rate of 1.2 percent was used to project operations by aircraft type at MRB through 2036. The latest 2017 TAF for MRB indicates growth in operations as well (as shown in **Table 2.4** and **2.5**). Despite the significant difference in the number of operations reported in the 2017 TAF and ATCT data, the two data sources project growth during the planning period. Therefore, **Table 2.9** reflects a modest growth in operations at MRB based on national trends.

Table 2.9 details the forecasted operations by aircraft type for the planning period.

Table 2.9- Forecast of Operations by Type

YEAR	SINGLE- ENGINE PISTON	MULTI- ENGINE PISTON	TURBO- PROP	JET	ROTORCRAFT	LIGHT SPORT	TOTAL
Base							
2016	12,624	2,441	5,161	5,083	732	94	26,135
Forecast	:						
2021	12,740	2,464	5,775	5,829	815	118	27,741
2026	12,813	2,478	6,442	6,660	905	148	29,446
2036	12,826	2,480	7,930	8,608	1,103	230	33,177

Sources: Delta Airport Consultants, Inc. Analysis





Table 2.10 shows the MRB aircraft operations forecast as developed in the 1990 Master Plan for MRB. Historical data from the ATCT identifies that in 2007, MRB had 18,588 total operations; whereas, the 1990 Master Plan forecast indicated there would be approximately 40,000 operations. The assumption in the forecast of growth for MRB from the 1990 Master Plan may not have happened for many reasons such as national, state, and/or local economic trends and the change in military operations due to the change in aircraft from the C-130 to the C-5, and finally to the current C-17.

The percentage of local versus itinerant operations was calculated from the ATCT data for year end 2016. **Table 2.11** details the local/itinerant operations forecast at MRB.

Table 2.10- Local/Itinerant Operations (1990 Master Plan)

YEAR	OPERATIONS			
	Local	Itinerant	Total	
1992	28,694	9,565	38,259	
1997	29,259	9,753	39,012	
2007	30,118	10,039	40,157	

Source: 1990 MRB Master Plan



Table 2.11- Forecast of Local/Itinerant Operations at MRB

YEAR	TOTAL OPERATIONS	LOCAL OPERATIONS (36%)	ITINERANT OPERATIONS (64%)		
		General Aviation	General Aviation	Air Taxi	Military
Base					
2016	26,135	9,409	10,193	1,306	5,227
Forecast					
2021	27,741	9,620	10,693	1,465	5,963
2026	29,446	9,816	11,210	1,639	6,781
2036	33,177	10,170	12,293	2,034	8,680

Source: Delta Airport Consultants, Inc. Analysis, Airport Records





The determination of the existing and future design aircraft at MRB will be useful to establish the future airport reference code (ARC) for the airport. The design aircraft, also referred to as the critical aircraft, is defined as the most demanding aircraft type, or grouping of aircraft with similar chartacteristics, that make regualar use of the airport. Regular use is 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations (official new definition as of June 2017). This aircraft can be a specific aircraft model or a composite of several aircraft using, expected to use, or intended to use the airport or part of the airport. In most cases, the design aircraft for purposes of geometric design is a composite aircraft representing a collection of aircraft classified by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG).

Historically, MRB has been designated as a C-IV airport. This designation is largely due to the continuous presence of the Air National Guard. The 2006 Airport Layout Plan (ALP) noted that the critical aircraft operating at the airport was the C-130 and the ultimate aircraft was the C-5A Galaxy. Currently, the aircraft operated by the Air National Guard is the C-17 Globemaster III.

The ANG operates in the northern portion of the airfield, Runway 8-26 and Taxiway A are designed to accommodate larger military aircraft. For the purposes of this Master Plan, design aircraft for activities located south of Runway 8-26 were evaluated based on civilian aircraft for general aviation activity. Keys to identifying the design aircraft are a review of the aircraft currently based at the airport and an examination of available information related to transient aircraft visiting the airport. A review of the based aircraft inventory and instrument flight rule operational logs shows that a diverse group of aircraft types uses MRB. These include a wide variety of single-engine piston, multi-engine piston, turbo-prop, and jet aircraft that use the runway, several of which have B approach speeds and several with Group II wingspans. An example of typical aircraft to be used at MRB would be the Beechcraft Super King Air 200.



In summary, it is recommended that the design aircraft for Runway 8-26 and Taxiway A remain as C-IV. Based on the usage of the general aviation facilities south of Runway 8-26, the design aircraft is recommended to be B-II. The long-range disposition of the general aviation facilities will be addressed in Chapter Three, Facility Requirements and Chapter Four, Alternatives Analysis.





Peak period operations are a key element in evaluating facility requirements during periods of high demand. General aviation facility needs are related to peak period activity and the most common and useful peaking characteristic of an airport is peak hour activity. An industry accepted methodology is used to estimate peak period activity that does not require a census of hourly operations totals and includes the following steps:

- Peak Month Peak month operations are calculated assuming that the peak month is 10 percent busier than the average month (annual operations/12 x 110 percent).
- Average Peak Day Average peak day operations are defined as the average day during the peak month. It is calculated by dividing the peak month by 30.
- Peak Hour Peak hour operations represent the highest number of operations during the busiest hour of an average day during a peak month. Peak hour operations are assumed to be 15 percent of the average peak day.

Table 2.12 presents the forecasted, peak general aviation operations at MRB during the planning period based on the methodology detailed above.



Table 2.12- General Aviation Operations Peak Period Forecast

YEAR	TOTAL ANNUAL OPERATIONS	PEAK MONTH	AVERAGE DAY (DURING PEAK MONTH)	AVERAGE DAY	PEAK HOUR
Base					
2016	26,135	2,396	80	73	12
Forecast					
2021	27,741	2,543	85	77	13
2026	29,446	2,699	90	82	14
2036	33,177	3,041	101	92	15

Sources: Delta Airport Consultants, Inc. Analysis





Table 2.13 presents a summary of the forecasts for MRB over the 20-year planning period. These forecasts indicate that aviation demand at the airport will continue to grow during the planning period. Ongoing development of facilities will enable the airport to continue to accommodate the growth in aviation demand and contribute to the economic vitality of the service area. Facility requirements and plans are presented in future chapters.

The forecast was approved by the FAA in May 2017.



Table 2.13- Summary of Forecasts over the 20-Year Planning Period

2016 OPERATIONS (BASE)	2021	2026	2036
91	95	99	108
67	67	67	67
13	13	13	13
2	3	4	6
8	9	10	12
1	2	3	6
0	1	2	4
26,135	27,741	29,446	33,177
9,409	9,620	9,816	10,170
10,193	10,693	11,210	12,293
1,306	1,465	1,639	2,034
5,227	5,963	6,781	8,680
12,624	12,740	12,813	12,826
2,441	2,464	2,478	2,480
5,161	5,775	6,442	7,930
5,083	5,829	6,660	8,608
732	815	905	1,103
94	118	148	230
	OPERATIONS (BASE) 91 67 13 2 8 1 0 26,135 9,409 10,193 1,306 5,227 12,624 2,441 5,161 5,083 732	OPERATIONS (BASE) 2021 91 95 67 67 13 13 2 3 8 9 1 2 0 1 26,135 27,741 9,409 9,620 10,193 10,693 1,306 1,465 5,227 5,963 12,624 12,740 2,441 2,464 5,161 5,775 5,083 5,829 732 815	OPERATIONS (BASE) 2021 2026 91 95 99 67 67 67 13 13 13 2 3 4 8 9 10 1 2 3 0 1 2 26,135 27,741 29,446 9,409 9,620 9,816 10,193 10,693 11,210 1,306 1,465 1,639 5,227 5,963 6,781 12,624 12,740 12,813 2,441 2,464 2,478 5,161 5,775 6,442 5,083 5,829 6,660 732 815 905

Sources: Delta Airport Consultants, Inc. Analysis



